

Name _____

Period _____

Velocity from a position verse time graph

1. Define **Velocity**: _____

2. What is the equation for velocity? $v = \frac{\Delta x}{\Delta t}$ or $v = \frac{\Delta x}{\Delta t}$
 words symbols

3. The symbol Δ alone stands for: _____

4. The symbol x alone stands for: _____

Together Δx stands for change in position.

5. In one word, what does Δx stand for? _____

6. If we are given a scale, what equation can we use to find Δx ?

$\Delta x = \text{_____} - \text{_____}$

7. The f in x_f stand for: _____ x_f is also known as ending position

8. The i in x_i stand for: _____ x_i is also known as starting position

9. Displacement is different than distance in that it is the total change of position, it does not account for the total length of the path traveled. Displacement is also different because it is a vector quantity and vector quantities include a number, a unit and a _____.

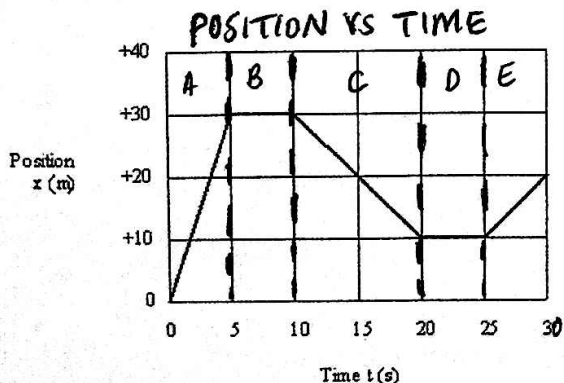
10. What are FOUR examples of units that displacement can be measured in? Be sure to include the SI unit of displacement, CIRCLE it so that it stands out.

a. MILES b. METERS c. FEET d. YARDS

11. The symbol t alone stands for: _____

12. What are FOUR examples of units that time can be measured in? Be sure to include the SI unit of time, CIRCLE it so that it stands out

a. MINUTES b. HOURS c. DAYS d. SECONDS



13. Break up the graph to the left each time the slope changes. Find the displacement of the object for sections A, B, C, D, and E. BE SURE TO INCLUDE UNITS AND A DIRECTION!

A: $\Delta x = \text{_____}$ D: $\Delta x = \text{_____}$
 B: $\Delta x = \text{_____}$ E: $\Delta x = \text{_____}$
 C: $\Delta x = \text{_____}$

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Position x (meters) versus Time (seconds) graph overview**What does this mean about VELOCITY?!**

On a position versus time graph...

... A **FLAT LINE** means: The object is at rest at the position indicated by the y-axis

14. What does this mean about the velocity of the object?

- a. Its velocity is changing / it is not constant
- b. Its velocity is staying constant at some positive or negative value indicating that the object is changing position
- c. It has no velocity because the object is not moving or changing position.

... A constant **POSITIVE** slope above the x-axis means: that the object is moving at the same rate away from the origin

15. What does this mean about the objects velocity

- a. Its velocity is constant and must be positive because the objects displacement is positive
- b. Its velocity is constant and must be negative because the objects displacement is negative
- c. It has no velocity because the object is not moving or changing position.

... A constant **NEGATIVE** slope above the x-axis means: that the object is moving at the same rate towards the origin

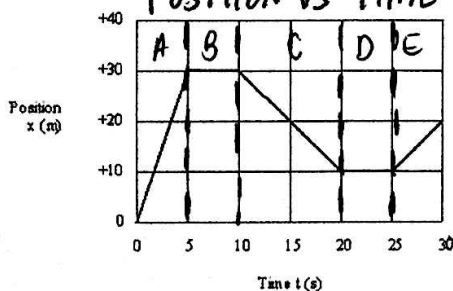
16. What does this mean about the objects velocity

- a. Its velocity is constant and must be positive because the objects displacement is positive
- b. Its velocity is constant and must be negative because the objects displacement is negative
- c. It has no velocity because the object is not moving or changing position.

... **Steep vs shallow:** a steeper slope means that the object is moving at a faster rate.

17. What does that mean about the objects velocity?

- a. If the slope is steeper, the object is moving with a lower velocity
- b. If the slope is steeper, the object is moving with a higher velocity
- c. If the slope is steeper, the object must not be moving at all, it is at rest

POSITION VS TIME18. Break up the graph to the left each time the slope changes. Find the amount of **TIME** that passes in section A, B, C, D, and E. BE SURE TO INCLUDE UNITS!

A: t = _____ D: t = _____
 B: t = _____ E: t = _____
 C: t = _____

In the last reading you discovered that on a distance verse time graph, the slope is equal to the speed of the object.

Here is some new information: on a position versus time graph, the slope is equal to the velocity of the object!The **slope** or gradient of a line is a number that describes both the direction and the steepness of the line.

Physical Science

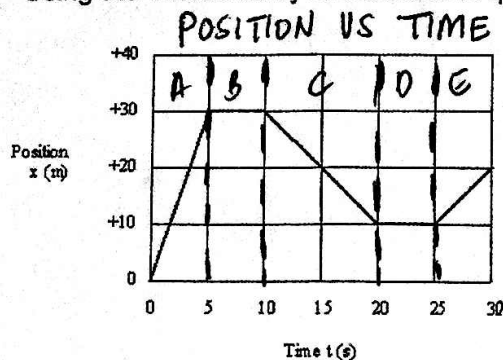
DSHS

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$$\text{Slope} = \frac{\text{RISE}}{\text{RUN}} = \frac{\text{CHANGE IN Y VALUE}}{\text{CHANGE IN X VALUE}} = \frac{\text{CHANGE IN POSITION}}{\text{CHANGE IN TIME}} = \frac{\Delta X}{\Delta t}$$

Using the information you collected in question #13 and #18, calculate the velocity of the object in each section:



19. Break up the graph to the left each time the slope changes.

20. Copy the information from questions 13 and 18 into the spaces for displacement and time below.

21. Calculate the VELOCITY of the object for sections A, B, C, D, and E.

BE SURE TO INCLUDE UNITS AND A DIRECTION!

A: $\Delta x/t = \underline{\hspace{2cm}} / \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$
 B: $\Delta x/t = \underline{\hspace{2cm}} / \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$
 C: $\Delta x/t = \underline{\hspace{2cm}} / \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$
 D: $\Delta x/t = \underline{\hspace{2cm}} / \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$
 E: $\Delta x/t = \underline{\hspace{2cm}} / \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

A: at any point from 0-5 seconds, the object is moving at a velocity of _____

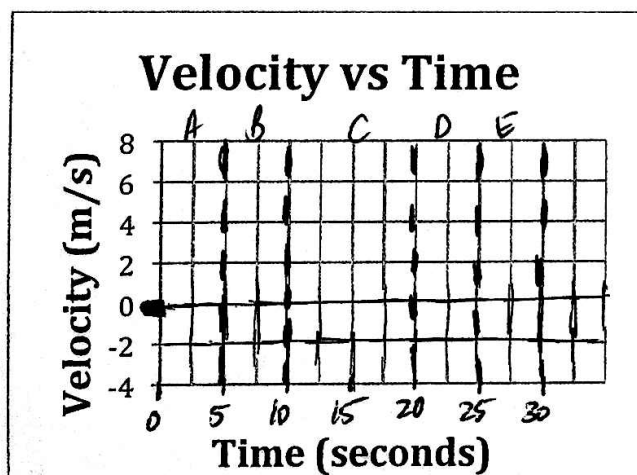
B: at any point from 5-10 seconds, the object is moving at a velocity of _____

C: at any point from 10-20 seconds, the object is moving at a velocity of _____

D: at any point from 20-25 seconds, the object is moving at a velocity of _____

E: at any point from 25-30 seconds, the object is moving at a velocity of _____

NOW.... Break the graph below up into sections that match the sections in your position vs time graph above. Take calculated values for velocity and create a velocity verse time graph.



STOP!!! HAVE YOUR GRAPH CHECKED BY ONE OF THE CLASSROOM TEACHERS!!!!

Take a few minutes to look back at your answers for #14-17. Do your answers make sense? If not correct your mistake(s)!

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Velocity v (meters/second) versus Time (seconds) graph interpretation**What does this mean about VELOCITY?!**

Using the information from the previous page, complete the following sentences:

On a velocity versus time graph...

... A **FLAT LINE** on the y value zero means:... A **FLAT LINE** on a positive y value means:... A **FLAT LINE** on a negative y value means:

Take an educated guess...

... A constant **POSITIVE** slope above the x-axis means [CIRCLE YOUR ANSWER]:

- a. The velocity is increasing
- b. The velocity is decreasing
- c. The velocity is staying constant

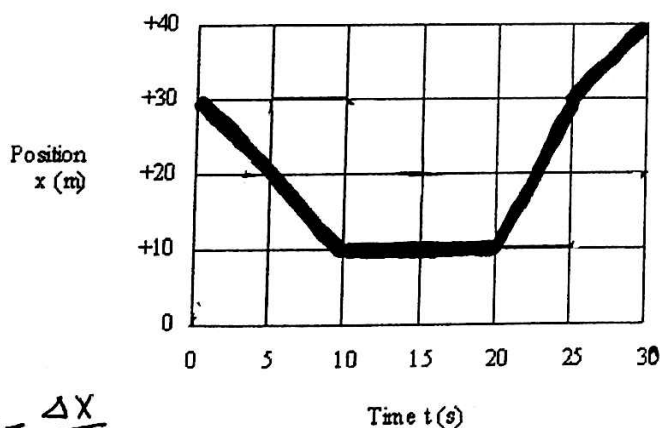
... A constant **NEGATIVE** slope above the x-axis means [CIRCLE YOUR ANSWER]:

- a. The velocity is increasing
- b. The velocity is decreasing
- c. The velocity is staying constant

Try one more on your own without being walked through each step!

Create a velocity versus time graph from the position versus time graph! If you are feeling unsure about how to start review how you began the guided example! Show your work below the graphs!

Position vs Time



$$V = \frac{\Delta x}{t}$$

*** HINT - YOU SHOULD HAVE 4 SECTIONS! FIND VELOCITY FOR:**

A:

B:

C:

D:

Velocity vs Time

